utilizing an air and fuel induction system, and operated without an approved backfire flame arrester, must either include a reed valve assembly or be installed in accordance with SAE J–1928, or other standard specified by the Commandant.

(3) An arrangement of the carburetor or engine air induction system that will disperse any flames caused by engine backfire. The flames must be dispersed to the atmosphere outside the vessel in such a manner that the flames will not endanger the vessel, persons on board, or nearby vessels and structures. Flame dispersion may be achieved by attachments to the carburetor or location of the engine air induction system. All attachments must be of metallic construction with flametight connections and firmly secured to withstand vibration, shock, and engine backfire. Such installations do not require formal approval and labeling but must comply with this subpart.

(4) An engine air induction system on a vessel with an integrated engine-vessel design must be approved, marked, and tested under § 162.043 in subchapter Q of this chapter, or other standard specified by the Commandant.

§ 182.420 Engine cooling.

(a) Except as otherwise provided in paragraphs (b), (c), (d), and (e) of this section, all engines must be water cooled and meet the requirements of this paragraph.

(1) The engine head, block, and exhaust manifold must be water-jacketed and cooled by water from a pump that operates whenever the engine is operating.

(2) A suitable hull strainer must be installed in the circulating raw water intake line of an engine cooling water system.

(3) A closed fresh water system may be used to cool the engine.

(b) An engine water cooling system on a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, may comply with the requirements of ABYC Project P–4, ''Marine Inboard Engines,'' instead of the requirements of paragraph (a) of this section.

(c) On a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, a propulsion gasoline engine may be air cooled when in compliance with the requirements of ABYC Project P–4.

(d) An auxiliary gasoline engine may be air cooled when:

(1) It has a self-contained fuel system and it is installed on an open deck; or

(2) On a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, it is in compliance with the requirements of ABYC P–4.

(e) A propulsion or auxiliary diesel engine may be air cooled or employ an air cooled jacket water radiator when:

(1) Installed on an open deck and sufficient ventilation for machinery cooling is available;

(2) Installed in an enclosed or partially enclosed space for which ventilation for machinery cooling is provided, which complies with the requirement of § 182.465(b), and other necessary safeguards are taken so as not to endanger the vessel; or

(3) Installed on a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, in compliance with the requirements of ABYC Project P–4.

§ 182.422 Keel and grid cooler installations.

(a) A keel or grid cooler installation used for engine cooling must be designed to prevent flooding.

(b) Except as provided in paragraph (e), a shutoff valve must be located where the cooler piping penetrates the shell, as near the shell as practicable, except where the penetration is forward of the collision bulkhead.

(c) The thickness of the inlet and discharge connections, outboard of the shutoff valves required by paragraph (b) of this section, must be at least Schedule 80.

(d) Short lengths of approved nonmetallic flexible hose, fixed by two hose clamps at each end of the hose, may be used at machinery connections for a keel cooler installation.

(e) Shutoff valves are not required for keel or grid coolers that are integral to